Bull. Southern California Acad. Sci.
93(3), 1994, pp. 127–134

Amphisamytha fauchaldi: A New Species of Ampharetid (Annelida: Polychaeta) from the Hydrothermal Vents at Guaymas Basin, Mexico

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Abstract.—A new species of the polychaete family Ampharetidae, *Amphisamytha fauchaldi,* is described from the hydrothermal vents at Guaymas Basin in the Gulf of California, Mexico, at a depth of 2020 m. This is a very common species in the sampling site. The environment is also described and comments are given about the species inhabiting the area.

The hydrothermal vents have been studied intensely since they were discovered in 1977 (Corliss et al. 1979). They constitute a most unusual habitat where tectonic activity and toxic emissions (mostly H_2S) at high temperatures (270–400°C) combine to harbor an exotic and dense fauna (Tunnicliffe 1992).

At Guaymas Basin, the hydrothermal vents differ from others known in the East Pacific Rise, in that there are sediments entering the Gulf of California from the Colorado River. Sediments accumulating at a rate of more than 1 m/1000 years, have covered the rift floor to a depth up to 400 m. Hydrocarbons are formed and percolate through the area (Simoneit 1985). Dense accumulations of organisms, dominated by the giant tubeworm *Riftia pachyptila* Jones, occur in close relationship with the hot springs.

Among the abundant biological material obtained from the *Riftia* washings collected during the Guaymas Basin expedition of February 1988, an undescribed ampharetid was found in large numbers.

The holotype is deposited in the collection of the National Museum of Natural History, Smithsonian Institution (USNM). Paratypes and representatives of the species described were deposited in the collections of the Australian Museum (AM), the British Museum (Natural History) (BM), the Hamburg Zoologische Museum (HMZ), The National Museum of Wales (NMW), the Zoological Museum at the University of Copenhagen (ZMUC), the Muséum National d'Histoire Naturelle de Paris (MNHN), the Los Angeles County Natural History Museum (LANHM), and the Instituto de Ciencias del Mar y Limnologia, UNAM, collection (ICML-UNAM), as well as the Dr. J. Frederick Grassle (FG) collection.

Study Area

Guaymas Basin is located in the Central region of the Gulf of California, Mexico, approximately at 27°00'North latitude and 111°25'West longitude. The sampling site is located in the Southern Basin in 2000–2020 m depths.

The site was discovered in 1980 (Lonsdale et al. 1982), and has been studied since 1982 (Lonsdale 1984; Grassle 1986). Previous geophysical studies have

shown that in the Gulf of California two large spreading centers exist: the Northern and the Southern Basins.

The Guaymas Basin differs from other hydrothermal active sites in the Pacific Rise in the particular geographic and geological conditions of its spreading centers. Because of land erosion and sediments from the Colorado River and planktonic blooms, there is an organic rich sediment deposit over the area about 400 m deep which prevents therefore lava eruption. One of the consequences of the transport of hot fluids through the organically enriched sediments is the geologically rapid formation of hydrocarbons which percolate through the area (Lonsdale et al. 1980; Simoneit and Lonsdale 1982; Lonsdale 1984).

In the Southern Basin where the samples were taken, the vertical temperature gradients around the bottom are greater than 4°C/m. The sulphur rich fluids that discharge through the chimneys do so at temperatures ranging from 270–314°C.

The site of collection was on the side of a seamount and from soft sediments away from other visible megafauna.

Dense thickets of *Riftia pachyptila* dominate the biota at the seamount. They are often lined with abundant mucus which provides an adequate habitat for a large array of organisms, among them *A. fauchaldi,* a polynoid polychaete and limpets. In addition, there are large mats of light orange and yellowish bacteria known as *Beggiatoa,* several galatheid crabs and some clams. The clams found around the area are small and do not dominate as in other hydrothermal vents.

Materials and Methods

The specimens were collected by one of the authors (VSW) in February 1988 using DSRV "ALVIN" Dive 1979, during the Guaymas Basin expedition of 1988 to the Gulf of California. Collections included *Riftia* washings. The specimens were washed and sieved through a 0.3 mm mesh, then fixed in buffered formalin and later preserved in 70% alcohol (Fauchald 1977).

Results

Amphisamytha fauchaldi new species
Figures 1A–E

Material examined.—Guaymas Basin, Southern Trough, *Riftia* washings, *Alvin* Dive 1979, 18 Feb 1988, 2014 m, holotype (USNM) and 124 paratypes (USNM holotype 168087 + 20 paratypes 168088); AM 10 paratypes (W21709), BM 15 paratypes (1993:5–14); HMZ 10 paratypes (*P*21986); NMW 10 paratypes (NMW.Z.1993.027); ZMUC 5 paratypes (POL-00020); MNHN 5 paratypes (UD 240 (vial A 923)); LANHM 10 paratypes (LACM-AHF1655); ICML-UNAM 29 paratypes (PO-68-002); and FG 10 paratypes (no numbers assigned).

Description.—The holotype is a complete specimen measuring 20 mm long. The paratypes vary from 3.5 mm to 20.5 mm, the most abundant size class being 13.5–14 and 15–16 mm. The smallest ovigerous females are 9.5 mm in length. In Table 1, some morphometric measurements are given from 22 specimens chosen among the total (which was too high to be convenient to include here) so as to give an idea of the variability of the characters present in the different size classes of the mature specimens. Color in life as well as in preserved specimens is light brown. The deep-red heartbody could be seen dorsally over the first seven segments through the translucent body wall in living material.

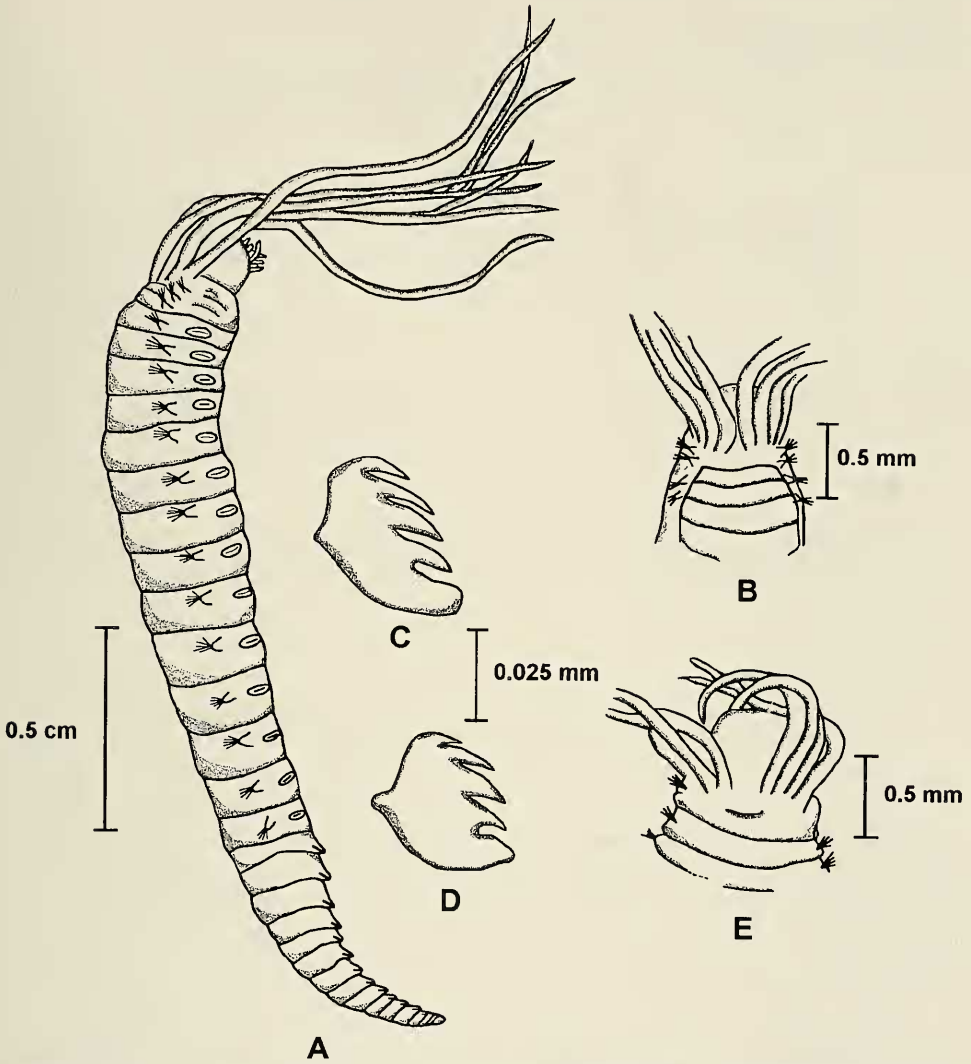

Fig. 1. 1A. *A. fauchaldi,* holotype; entire worm, dorsolateral view. 1B. *A. fauchaldi,* holotype; dorsal view of the prostomium with branchial disposition. 1C. *A. fauchaldi,* holotype; thoracic uncinus. 1D. *A. fauchaldi,* holotype; abdominal uncinus. 1E. *A. galapagensis,* holotype; dorsal view of prostomium with branchial disposition.

The eggs found in the gravid females are small, subcircular with a white central vessicle about one third of the length of an entire brownish egg.

There are 17 thoracic setigers (14 uncinigers) and 13 to 15 abdominal uncinigers (14 in the holotype); (Fig. 1A).

Prostomium indistinctly trilobed and slightly notched with no glandular ridges. Mouth bilobed, oral tentacles numerous, deciduous, ventrally grooved and retractile.

Four pairs of finely annulated long branchiae (approximately 15 mm in holotype), narrowly grooved ventrally, individually inserted across the dorsal surface

Table 1. Some morphometric measurements of *A. fauchaldi*.

	Total length (mm)	Length of branchiae (mm)	Torax width (mm)	No. of setae, fir setiger	Maximum no. of setae in thorax	Maximum no. of thoracic uncini	Length abdomen (mm)	No. of abdominal setigers	Maximum no. of abdominal uncini	Eggs present
H	19.0	15.0	3.0	11	15	59	5.5	15	32	no
	20.0	16.0	4.0	11	16	69	6.0	14	38	no
	17.0	13.0	3.5	12	17	54	5.0	13	30	yes
	17.0	13.0	3.5	10	15	62	4.5	13	28	no
	16.0	12.0	3.0	9	15	55	4.5	14	28	no
	15.0	12.0	4.0	12	15	64	3.5	13	28	yes
	16.0	13.0	3.0	11	16	50	4.5	14	28	no
	18.0	17.0	3.5	11	16	68	5.5	15	28	yes
	13.5	10.0	3.0	10	14	47	3.5	14	24	no
	13.5	10.0	3.5	11	18	58	3.5	14	26	yes
	14.5	9.0	2.5	11	15	55	4.0	14	26	no
	14.0	11.0	3.0	11	16	51	3.5	15	25	yes
	14.5	11.0	3.0	11	16	53	4.5	15	25	yes
	14.0	14.0	3.5	11	16	50	5.0	14	22	yes
	13.5	10.0	3.0	11	16	52	3.0	14	24	no
	10.0	7.0	1.5	9	15	40	2.5	13	18	no
	10.0	9.0	2.0	9	14	44	2.5	15	22	yes
	9.5	11.0	2.0	11	14	38	2.5	14	22	no
	9.5	10.0	2.0	9	14	49	3.0	14	21	yes
	11.0	11.0	3.0	11	14	48	3.0	14	20	yes
	10.0	9.0	2.0	9	14	50	3.0	14	23	yes
	10.0	6.0	1.5	9	12	39	2.5	14	21	no
$\bar{x}$	13.89	11.59	2.86	10.45	15.14	52.50	3.86	14.05	25.41	
S.D.	3.15	2.81	0.73	0.99	1.25	8.33	1.07	0.64	4.40	

H = holotype; $\bar{x}$ = mean; S.D. = standard deviation.

of segments 2 to 5 so that the first pair is associated to the last asetigerous segment. The inner pair is associated with the last asetigerous segment. The inner pair is associated with the 5th segment in the normal ampharetid fashion. There is no gap between the branchial groups (Fig. 1B).

Segments 1 and 2 fused, ventrally forming the lower lip which shows two ventrolateral grooves. Segment 3 asetigerous. Paleae absent.

First thoracic setiger reduced with a bundle of 10–12 capillary winged smooth notosetae. Second and third setigers are dorsal to the others.

Notopodial lobes bear 15–18 winged smooth capillary setae in two rows with about 7–8 long setae behind 8 short ones.

Neuropodial lobes (uncinigerous pinnules) each with a single transverse row of uncini from setiger 4 to the end of abdomen. Number of thoracic uncini per setiger varies with length of the organism. It can be as high as 68 in longest specimens and around 38 in small specimens (Table 1). The shape of the thoracic uncini is shown in Fig. 1C. They bear four denticles above a squared-off base with a distinct prow; subrostral tip tiny, uppermost denticle smallest.

Abdomen consisting of 13 to 15 (directly related to size) gradually tapering setigers bearing only neuropodial lobes, distinctly different from thoracic ones, rounded, with a glandular pad covering a few uncini and prolonged dorsally.

Shape of thoracic and abdominal uncini shown in Fig. 1C and 1D. Four denticles present. Number of abdominal uncini per setiger is also a function of length, varying from 18 in the smallest to 38 in the largest organisms (Table 1).

Pygidium rounded, bearing two large lateral papillae, three small dorsal papillae and a smoother ventral pad, but no true anal cirri. Anal aperture terminal.

Tubes.—Specimens embedded in clumps of many tubes parallel to each other and held together by a mucous substance. There were as many as 20 tubes in a clump. Outer tubes formed by aggregates of fine sediments and different debris, arranged as transverse white and dark brown areas. Inner part of tubes formed by whitish, translucent, vertically oriented linings. Only part of the anteriorly oriented branchiae protruding from the tubes which are simple or branched. Some specimens were found attached to the outer walls of the *Riftia* tubes to which they adhered by similar mucus.

Remarks.—Along with *Amphisamytha fauchaldi,* which was by far the most abundant organism, we collected in the clumps several black limpets (7, one of them very small), 26 specimens of *Ophryotrocha akessoni* Blake, six specimens of *O. platykephale* Blake (Solis-Weiss and Hilbig 1992) and one large alvinellid: *Paralvinella grasslei.*

Etymology.—This species is dedicated to Dr. Kristian Fauchald, an outstanding polychaetologist, as a small attempt to acknowledge all the help and friendship provided for so many years.

Discussion

This species belongs to the group of ampharetids with four rather than three pairs of branchiae. It is easily distinguished from the species *A. japonica* (Hessle) and *A. bioculata* (Moore) as mentioned by Zottoli (1983) by the lack of anal cirri and by the possession of glandular pads in the abdominal segments.

A. fauchaldi is closely related to *A. galapagensis* Zottoli, also a vent dweller found in the Galapagos site, from which it differs mainly in that there is a clear

Table 2. List of the Annelid Polychaetes reported from the Guaymas Basin.

Family Alvinellidae
Paralvinella grasslei Desbruyeres & Laubier, 1982
Family Cossuridae
Cossura sp. 1 Grassle et al., 1985
Family Dorvilleidae
Exallopus jumarsi Blake, 1985***
Ophryotrocha akessoni Blake, 1985
Ophryotrocha platykephale (Blake, 1985)***
Family Euphrosinidae
Euphrosine rosacea Blake, 1985
Family Glyceridae
Glycera profundi Chamberlin, 1919
Family Hesionidae
Nereimyra alvinae Blake, 1985
Orseis grasslei Blake, 1985***
Family Nereididae
Ceratocephale pacifica Hartman, 1960***
Nereis sandersi Blake, 1985
Family Polynoidae
Bathykurila guaymasensis Pettibone, 1989***
Branchinotogluma grasslei Pettibone, 1985b
Branchinotogluma sandersi Pettibone, 1985b
Branchiplicatus cupreus Pettibone, 1985a
Lepidonotopodium williamsae Pettibone, 1984
Lepidonotopodium riftense Pettibone, 1984
Macellicephaloides alvini Pettibone, 1989***
Opisthotrochopodus alvinus Pettibone, 1985b
Family Sigalionidae
Neoleanira racemosa (Fauchald, 1972)
Family Spionidae
Lindaspio dibranchiata Blake & Maciolek, 1992***
Spiophanes sp. 1 Grassle et al., 1985

*** Species found so far only in the Guaymas Basin.

branchial gap between the two groups of branchiae in *A. galapagensis* (Fig. 1E); such a gap is absent in *A. fauchaldi.* This is a much larger species than *A. galapagensis,* which measures 3–10 mm in length compared to 14–20 mm in *A. fauchaldi.*

General remarks about the polychaete fauna of Guaymas Basin.—So far there have been 22 species of polychaetes found in the Guaymas Basin site (Table 2). From these, 17 were newly described from the area (Desbruyeres and Laubier 1982; Blake 1985; Grassle et al. 1985; Pettibone 1984, 1985a, b, 1989; Blake and Maciolek 1992) and two presumably undescribed (*Cossura* sp. 1 and *Spiophanes* sp. 1) (Grassle et al. 1985). Eight species of polynoids mainly in the genus *Branchinotogluma* Pettibone, and dorvilleids with three species represent the highest species richness for this group. The diversity was low as is normal for these

environments but endemism was high. Seven species are known only from Guaymas. Closer examination of additional material may prove that species formerly assigned to already described ones will turn out to be new as in the case of *A. fauchaldi.* The Gulf of California is already known for its endemism, brought about in great part by its configuration with its relatively small opening to the Pacific Ocean.

Acknowledgements

We wish to thank Dr. J. F. Grassle for inviting us to participate in the project and for his constant help and encouragement and Dr. K. Fauchald for his continuous help. The project on the Mexican part was supported by the Instituto de Ciencias del Mar y Limnologia, UNAM.

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Accepted for publication 27 September 1993.